to Western ingredients. In New York City, the Momofuku restaurant group's Culinary Lab has focused on miso- and tamari-like pastes and sauces made from non-soya bases such as cashews, pistachios, chickpeas and spelt. Copenhagen's renowned Noma and the affiliated Nordic Food Lab have had good results with a yellow-pea 'peaso', a barley *koji* roasted to a chocolate brown and versions of fish sauces made from grasshoppers and from *koji*-treated beef.

These experiments with fusion fermentation are probably just a taste of things to come. The James Beard Foundation, a New York-based organization of professional chefs, gave its award for the best reference book of 2013 to Sandor Ellix Katz's 500-page *The Art of Fermentation* (Chelsea Green Publishing), a jaw-dropping survey of possibilities from abará (Nigerian steamed or boiled fermented cowpeas) to zur (Polish sour rye porridge soup).

"Provocation rather than flavour has motivated experiments with what might be called personal fermentation."

Outside the restaurant world, provocation rather than flavour has motivated experiments with what might be called personal fermentation. After the Rogue Ales brewery in Newport, Oregon, failed to find beerworthy wild yeasts in its hop yard, it turned to a different local niche: a strain cultured from the brewmaster's hair follicles now goes into the making of its speciality Beard Beer. And noting that we regularly devastate our own microbiome to suppress its production of the same odours that we enjoy in fermented foods, biologist Christina Agapakis and artist Sissel Tolaas have developed an exhibit to help us to better appreciate our unsanitized selves: cheeses made from milk inoculated with swabs of volunteers' hands, feet, noses and armpits (see A. King *Nature* **503,** 196; 2013).

After a centuries-long stationary phase during which traditional food cultures slowly developed in isolation from each other, the world crock has been stirred and things are really bubbling. Will new fermentations grace our future holiday spreads? Even the possibility is worth toasting. ■

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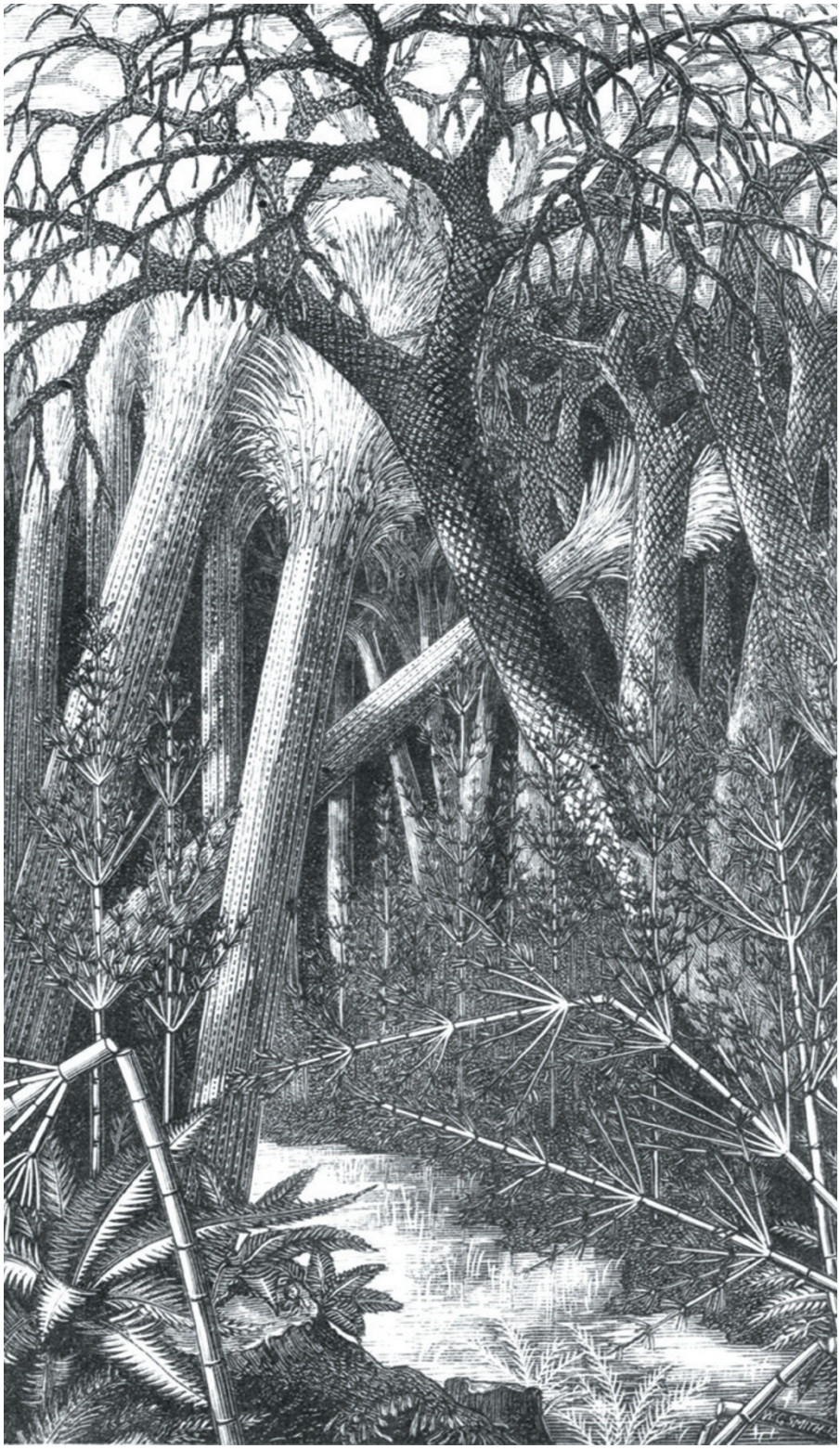

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A forest of the Carboniferous period as depicted in *The Fairy-Land of Science*.

EDUCATION

Fairylands of science

Melanie Keene revisits two Victorian children's science primers that harnessed interest in the supernatural.

Plum puddings, stockings and trees were not all of the Christmas thrill for American and British children in the second half of the nineteenth century. Many were given gifts of a special kind: primers that propelled them into a fairyland of science. These books inspired the young to imagine vast families of fairies at work beneath the visible world, building frosty forms on windowpanes and setting the fire crackling.

That fantastical construct was stoked by the then-widespread interest in the supernatural and folklore. It also complemented contemporary research in science, technology and medicine that was busy revealing or harnessing the previously unseen: from the vanished species of prehistory to the tantalizing promises of electricity; information that travelled at light-speed across the Universe to be captured in laboratories; and the 'monster soup' of disease lurking within a water pump. A handful of educators saw an opportunity to meld these two trends — notably Arabella Buckley and Lucy Rider Meyer, two women of science who, on opposite sides of the Atlantic, encouraged youthful enthusiasm for the wonders of nature.

Buckley and Meyer were part of a new generation of writers and educators who urged that science was for everyone. Their works emphasized hands-on investigations in the child's own home and environs — an approach that still permeates children's science publications. Although instructional books for juvenile audiences had existed for more than a century by the late 1800s, they were lampooned as dry fact-crammers. British and US publishers instead sought new genres that combined science with characters, illustrations, narratives and writing styles similar to those in children's fiction, then in a golden age dominated by the likes of Lewis Carroll. By the 1870s and 1880s, a range of genres — from autobiographies and object lessons to animal stories and voyages — were enlivening science for the young. At the same time, the writing, translation and collection of fairy tales was booming. This form was seen as ideal for revealing the hidden mysteries and histories of nature. As Buckley and Meyer masterfully showed, the real magic of nature surpassed the fictions of old.

Buckley's *The Fairy-Land of Science* was the best known of the fairy science books (she wrote many other popular-science works, including two on evolution). She drew on impeccable connections: she was geologist Charles Lyell's secretary for more than a decade, and was acquainted with the biologists Alfred Russel Wallace, Charles Darwin and Thomas Henry Huxley.

Buckley based this book on ten lectures she had delivered to children in London in 1878, touching on areas from animal behaviour to atmospheric science. It retains a charming conversational style, and includes black-and-white illustrations of experiments that Buckley performed live. It begins by describing objects that are familiar to the young reader: a primrose, a bee, a sunbeam, a drop of water. These constituents of the quotidian world, she argues, are protagonists in the fairy tales of nature; they provide transformations and revelations as astonishing as those wrought by imaginary sprites. In Buckley's layered text, her science fairies sometimes equate with the "forces" of nature, such as gravity, portrayed as a giant; elsewhere, they represent natural processes such as crystallization or cohesion.

Nature reviewed *The Fairy-Land of Science* in January 1879 (*Nature* **19,** 265; 1879), praising the book's goal of "showing how things far more wonderful than those related in fairy-tales are daily happening around us". This realm, the reviewer wrote, "may be entered by any one with eyes": a common argument of elementary educators, who were eager to extend scientific training to wider audiences. Acquiring the observational and technical skills necessary for understanding the sciences would, they wrote, be akin to developing superior senses and glimpsing the structures and forces hidden beneath the surfaces of things.

CHEMICAL HERITAGE FOUNDATION

In *Real Fairy Folks*, water is shown as an oxygen fairy holding hands with two hydrogen fairies.

The *Nature* reviewer felt, however, that Buckley should have focused on just one area of science. Meyer's 1887 book *Real Fairy Folks* took this route, exploring elementary chemistry in its most literal sense. Meyer had studied chemistry at the Massachusetts Institute of Technology in Cambridge in the late 1870s, and from 1879 to 1881 was a professor of chemistry at McKendree College in Lebanon, Illinois.

She, too, chose the domestic environment as the domain of wonder-working creatures. An avuncular Professor leads his young charges on a playful exploration of the "Fairy Land of Chemistry" (the book's alternative title). Meyer's main conceit was to present chemical elements as "fairy-tribes" — families of beings whose physical attributes mimic their chemical properties. Particular groups of elements are even termed cousins, and introduced in quasi-genealogical tables that convey their characteristics — such as "bad smell" for bromine and "violets" for iodine — as well as their masses in "fairy-pounds".

How slowly or quickly the fairies move reflects their frozen or gaseous chemical states and, as illustrated (supposedly by the Professor), the number of their limbs determines their propensity to form chemical bonds. Water is portrayed as the oxygen fairy clasping hands with two hydrogen fairies: "Oxygen has two hands, and every hand must be full." All flowing dresses and liquid tresses, the image capitalized on its audience's familiarity with depictions of fairies at the time, and neatly represented watery properties.

Meyer layers different types of explanation. These range from the "story" of balancing chemical equations to basic experiments that, like Buckley's, could be recreated by young readers ("the Professor held the edge of a white china plate in the flame a moment. On it the black fairies appeared in great numbers"). Importantly, Meyer urges the need for "imitative experiments" involving everyday objects such as candles, sugar or vinegar. These were easy to replicate and taught ordinary realities: chlorine, for instance, could disinfect a hospital ward.

The interplay between the fantastical and the familiar in these works converted homes and gardens into magical realms. This sense of wonder, both authors hoped, would remain with their readers when, as in Buckley's sequel *Through Magic Glasses* (D. Appleton; 1890), it was time to leave domestic fairyland and enter the laboratory.

Children today, unwrapping sophisticated chemistry sets or animatronic dinosaur models, are immersed in science. But as Buckley and Meyer emphasized, a sense of wonder is still the best start for seeing beneath and beyond the everyday world — to glimpse the marvellous processes, genes, forces, elements and particles that make up the Universe. ■

The Fairy-Land of Science
ARABELLA BUCKLEY
Edward Stanford (1st edn): 1879.

Real Fairy Folks: Explorations in the World of Atoms
LUCY RIDER MEYER
D. Lothrop and Company: 1887.

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